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Taxonomical Studies on Tintinnids (Protozoa: Ciliata) in Korean Coastal Waters 2. Yŏngil Bay

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한국산 유종섬모충류의 분류학적 연구 2. 영일만

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적요

본 연구는 해양생태계의 저차생산 단계의 생산자로 중요시 되고 있는 유종섬모충류(Tintinnina)의 분류학적 연구의 일환으로 진해만에 이어 영일만에서 1985년 9월부터 1988년 5월까지 약 4년간에 걸쳐 채집된 시료를 사용하여 유종섬모충류를 동정 분류한 결과, 총 11과 21속 52종이 출현하였다. 이들 52종중 진해만 일대에서 이미 보고된 종을 제외한 27종은 국내에서 처음으로 동정 분류를 하여 이를 한국산 미기록종으로 기재한다.

Key words: Taxonomy, Tintinnina, Yŏngil Bay, Korea.

INTRODUCTION

Tintinnids (ciliated protozoa, suborder Tintinnina) are major components of microzooplankton (Beers and Stewart, 1969, 1971) and are important predators on nanophytoplankton (Heinbokel and Beers, 1979; Rassoulzadegan and Etienne, 1981). In marine ecosystem the food pathway from nanoplankton production to higher tropic levels is known to be mediated by tintinnids (Sheldon *et al.*, 1986).

So that considerable recent studies have often been focused on clarifying the ecological role of tintinnids by providing a preliminary evaluation of the role of tintinnids as potential prey and predator through both laboratory and field experiments.

In contrast to the situation for ecological studies there is only a few taxonomical informations in recent works. The taxonomical works of tintinnids had largely been carried out prior to 1930's and many results on the qualitative distridution of tintinnids have been reported from a variety of marine habitats.

Since many species were previously insufficiently described, identification of the tintinnids species from preceding literatures (Kofoid and Campbell, 1929, 1939; Campbell, 1942; Hada, 1932a, b, c, 1935, 1937, 1938) based soly on the chracteristics of the lorica was somewhat diffcult. And it was emphasized that use of morphological characteristics through LM for the identification of tintinnds is not practical and in fact it is necessary to apply modern methods of taxonomy to all planktonic protozoa including tintinnids:phenetic or numerical taxonomy, cladistic taxonomy, and evolutionary taxonomy (Laval-Peuto, 1982).

As desirable modern methods of taxonomy to this suborder have not been obtained until now and classical taxonomy is at present the only practicable method, in our present study the determination of taxa in this suborder Tintinnina depends exclusively on LM data on the morphology of the lorica although the classical taxonomy recommended by Kofoid and Campbell is not sufficient evidently. Above all in Korean coastal waters the tintinnid fauna is still unknown, despite a number of published works on this fauna in many region of the world. Therefore the taxonomical studies of tintinnids are necessary for clarifying the structure and population dynamics of planktonic community in Korean coastal waters.

The purpose of the present study, following the taxonomical study on tintinnids in Chinhae Bay (Yoo, Kim and Kim, 1988) as a series of taxonomical studies on tintinnids in Korean coastal waters, is to identify the tintinnids in Yǒngil Bay and then to describe new recorded species with taxonomical notes.

MATERIALS AND METHODS

Samplings were made monthly from a fixed station in Yǒngil Bay from September 1985 to May 1988 (Fig. 1).

Surface seawater samples were collected with a plankton net and then fixed with 10% buffered formalin on board.

For the identification collected samples were rinsed with distilled water. The rinsed samples were isolated and placed on the slide by micropipetting and then mounted in glycerin jelly. The mounted samples were examined using a light microscope (OLYMPUS BHA) in higher magnification. And also some specimens were examined by scanning electron microscope (JEOL JSM-35C).

Photomicrographs and measurements of lorica were made as prescribed by Yoo, Kim and Kim (1988).

RESULTS AND DISCUSSION

Systematics

The following systematic treatment is based on Levine *et al.* (1980) and Corliss (1979, 1982) for familial and suprafamilial classification, and Loeblich & Tappan (1968) and Sano (1975) for subfamilial classification. Species identification is based on Kofoid and Campbell (1929, 1939), Campbell (1942) and Hada (1932a, b, c, 1935, 1938). A total of 52 species, representing 11 families and 21 genera, have been identified and 27 species among total identified species are new to Korean waters. The species of tintinnids found in the present study are listed as follows:

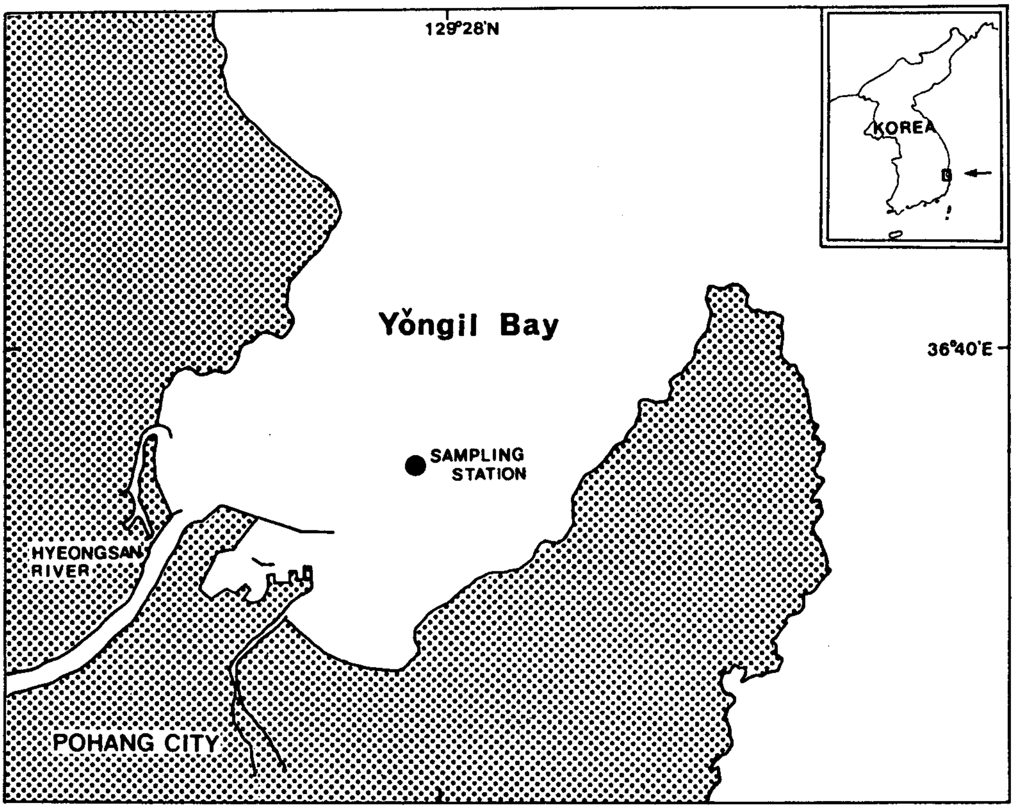

Fig. 1. The sampling station in Yŏngil Bay.

Phylum Ciliophora Doflein, 1901
Class Polyhymenophora Jankowski, 1967
Subclass Spirotrichia Butschli, 1889
Order Oligotrichida Butschli, 1887
Suborder Tintinnina Kofoid and Campbell, 1929
Family Tintinnididae Kofoid and Campbell, 1929
Genus *Leprotintinnus* Jorgensen, 1899

1. *Leprotintinnus neriticus* (Campbell, 1926)
2. *L. nordqvisti* (Brandt, 1906)
3. *L. simplex* Schmidt, 1901

Family Codonellidae Kent, 1882
Genus *Tintinnopsis* Stein, 1867

4. *Tintinnopsis angustior* (Jorgensen, 1924)
5. *T. beroidea* Stein, 1867
6. *T. butschlii* Daday, 1887
7. *T. corniger* Hada, 1964

8. *T. directa* Hada, 1932
9. *T. gracilis* Kofoid and Campbell, 1929
10. *T. kofoidi* Hada, 1932
11. *T. lohmanni* Laackmann, 1906
12. *T. radix* (Imhoff, 1886)
13. *T. tocantinensis* Kofoid and Campbell, 1929
14. *T. tubulosoides* Meunier, 1910

Family Codonellopsidae Kofoid and Campbell, 1929
Genus *Stenosemella* Jorgensen, 1924

15. *Stenosemella nivalis* (Meunier, 1910)
16. *S. pacifica* Kofoid and Campbell, 1929
17. *S. parvicollis* (Marshall, 1934)

Genus *Codonellopsis* Jorgensen, 1924

18. *Codonellopsis morchella* (Cleve, 1900)
19. *C. nipponica* Hada, 1964
20. *C. ostenfeldi* (Schmidt, 1901)

Family Metacylididae Kofoid and Campbell, 1929
Genus *Climacocylis* Jorgensen, 1924

21. *Climacocylis scalaroides* Kofoid and Campbell, 1929

Genus *Helicostomella* Jorgensen, 1924

22. *Helicostomella longa* (Brandt, 1906)
23. *H. subulata* (Ehrenberg, 1833)

Family Epiplocylididae Kofoid and Campbell, 1939
Genus *Epiplocyloides* Hada, 1938

24. *Epiplocyloides ralumensis* (Brandt, 1906)
25. *E. reticulata* (Ostenfeld and Schmidt, 1901)

Family Ascampbelliellidae Corliss, 1960
Genus *Ascampbelliella* Corliss, 1960

26. *Ascampbelliella urceolata* (Ostenfeld, 1899)

Genus *Acanthostomella* Jorgensen, 1927

27. *Acanthostomella norvegica* (Daday, 1887)

Family Ptychocylididae Kofoid and Campbell, 1929
Genus *Favella* Jorgensen, 1924

28. *Fevella ehrenbergii* (Claparede and Lachmann, 1858)
29. *F. taraikaensis* Hada, 1932

Genus *Ptychocylis* Brandt, 1896

30. *Ptychocylis obtusa* Brandt, 1896

Family Rhabdonellidae Kofoid and Campbell, 1929
Genus *Protorhabdonella* Jorgensen, 1924

31. *Protorhabdonella curta* (Cleve, 1901)
32. *P. simplex* (Cleve, 1900)
33. *P. striatura* Kofoid and Campbell, 1929

Genus *Rhabdonella* Brandt, 1907

34. *Rhabdonella poculum* (Ostenfeld and Schmidt, 1901)
35. *R. striata* (Biedermann, 1893)

Family Xystonellidae Kofoid and Campbell, 1929
Genus *Parafavella* Kofoid and Campbell, 1929

36. *Parafevella denticulata* (Ehrenberg, 1840)
37. *P. gigantea* (Brandt, 1896)

Family Undellidae Kofoid and Campbell, 1929
Genus *Undella* Daday, 1887

38. *Undella claparedei* (Entz, 1885)
39. *U. perpusilla* (Kofoid and Campbell, 1929)

Family Tintinnidae Claparade and Lachmann, 1858
Genus *Amphorides* Strand, 1926

40. *Amphorides amphora* (Claparede and Lachmann, 1858)
41. *A. minor* (Jorgensen, 1924)
42. *A. quadrilineata* (Claparede and Lachmann, 1858)

Genus *Steenstrupiella* Kofoid and Campbell, 1929

43. *Steenstrpiella robusta* Kofoid and Campbell, 1929

Genus *Amphorellopsis* Kofoid and Campbell, 1929

44. *Amphorellopsis acuta* (Schmidt, 1901)

Genus *Dadayiella* Kofoid and Campbell, 1929

45. *Dadayiella ganymedes* (Entz, 1884)

Genus *Eutintinnus* Kofoid and Campbell, 1939

46. *Eutintinnus elegans* (Jorgensen, 1924)
47. *E. lususundae* (Entz, 1885)
48. *E. pectinis* (Kofoid and Campbell, 1929)
49. *E. rectus* (Wailes, 1925)
50. *E. tubulosus* (Ostenfeld, 1899)

Genus *Salpingella* Jorgensen, 1924

51. *Salpingella acuminata* (Claparede and Lachmann, 1858)
52. *S. subconica* Kofoid and Campbell, 1929

Description of species

Suborder Tintinnina Kofoid and Campbell, 1929
Family Tintinnididae Kofoid and Campbell, 1929
Genus *Leprotintinnus* Jorgensen, 1899

Key to species

1. Lorica simple tubular, without an aboral flare -------------------- 2
   Lorica with a distinct aboral flare -------------------- *L. nordqvisti*
2. Larger lorica with a length above 300μm -------------------- *L. neriticus*
   Smaller lorica with a length 200μm -------------------- *L simplex*

1. *Leprotintinnus neriticus* (Campbell, 1926)

Tintinnus neriticus Campbell, 1926 (pp. 237-239, fig.1).

Leprotintinnus neriticus:Kofoid and Campbell, 1929 (p.17, fig.9).

Material examined: Yŏngil Bay, Oct., 1985

2. *Leprotintinnus nordqvisti* (Brandt, 1906)

Tintinnopsis nordqvisti Brandt, 1906 [cited from Kofoid and Campbell, 1929 (p.17)].

Leprotintinnus nordqvisti: Kofoid and Campbell, 1929 (p.17, fig.13); Hada, 1935 (p.244); 1938 (p.91, fig.3).

Meterial examined: Yŏngil Bay, Oct., 1985

3. *Leprotintinnus simplex* Schmidt, 1901

Leprotintinnus simplex Schmidt, 1901 [cited from Kofoid and Campbell, 1929 (p.18)]; Kofoid and Campbell, 1929 (p.18, fig.10); Hada, 1938 (p.90, fig.2).

Material examined: Yŏngil Bay, Oct., 1985

Family Codonellidae Kent, 1882

Genus *Tintinnopsis* Stein, 1867

Key to species

1.	Lorica with a cylindrical anterior region	2
	Lorica with a flaring anterior region	*T. butschlii*
2.	No aboral opening	3
	Aboral opening present	4
3.	Aboral end with a branching aboral horn	*T. conriger*
	Aboral end without a aboral horn	5
4.	Lorica with a inflating posterior region	*T. tocantinensis*
	Lorica with a conical posterior region	6
5.	Aboral end rounded	*T. directa*
	Aboral end acute or bluntly pointed	7
6.	Aboral region gradually tapering	*T. radix*
	Aboral region abruptly tapering	*T. kofoidi*
7.	Lorica with a inflating posterior region	8
	Lorica with a conical posterior region	9
8.	Lorica stout, with a spiral structure	*T. lohmanni*
	Lorica slender, without a spiral structure	*T. gracilis*
9.	Lorica stout bullet-shaped	*T. beroidea*
	Lorica slender bullet-shaped	10
10.	Suboral region without a spiral structure	*T. angustior*
	Suboral region with a spiral structure	*T. tubulosoides*

4. *Tintinnopsis angustior* (Jorgensen, 1924)

Tintinnopsis beroidea var. *angustior* Jorgensen, 1924 (p. 67-68, fig. 73).

Tintinnopsis acuminata: Kofoid and Campbell, 1929 (p.20, fig.43); Marshall, 1969 (sheet 117, p.3, fig.8); Gold and Morales, 1975a (p.523, fig.5); 1976 (p.383, fig.6).

Tintinnopsis angustior: Hada, 1937 (p.161, fig.14).

Material examined: Yŏngil Bay, Oct., 1985

5. *Tintinnopsis beroidea* Stein, 1867

Tintinnopsis beroidea Stein, 1867 [cited from Kofoid Campbell, 1929 (p.28)]; Kofoid and Campbell, 1929 (p.28, fig.26); Hada, 1932b (p.41, fig2); 1932c (p.554); 1937 (p.156, fig.9); 1938 (p.93, fig.4); Kofoid and Campbell, 1939 (p.38, pl.1, fig.1); Tregouboff, 1957 (p.241, pl.56, fig.7); Marshall, 1969 (sheet 117, p.6, fig.19); Cosper, 1972 (p.395, fig.9); Gold and Morales, 1975a (p.523, fig.7)

Material examined:Yŏngil Bay, Mar., 1986

6. *Tintinnopsis butschlii* Daday, 1887

Tintinnopsis Butschlii Daday, 1887 [cited from Kofoid and Campbell, 1929 (p.29)].

Tintinnopsis butschlii Kofoid and Campbell, 1929 (p.29, fig.85); Hada, 1932c (p.557, fig5); Balech, 1948 (p.10, figs.26-33); Tregouboff, 1957 (p.241, pl.56, fig.9); Marshall, 1969 (sheet 117, p.6, fig.26).

Material examined: Yongil Bay, Oct, 1986

7. *Tintinnospsis corniger* Hada, 1964

Tintinnopsis corniger Hada, 1964 (p.2, fig.2); Balech, 1968 (p. 169, figs.5-7).

Material examined:Yŏngil Bay, Sept., 1986

8. *Tintinnopsis directa* Hada, 1932

Tintinnopsis patula:Kofoid and Campbell, 1929 (p. 43, fig.62).

Tintinnopsis directa Hada, 1932c (p.557, fig.4); 1938 (p.99, fig.12); Balech, 1968 (p.167, fig.3).

Material examined: Yŏngil Bay, July, 1986

9. *Tintinnopsis gracilis* Kofoid and Campbell, 1929

Tintinnopsis gracilis Kofoid and Campbell, 1929 (p.36, fig.37); Hada, 1935 (p.244); 1938 (p.96, fig.9); Balech, 1948 (p.7, figs. 17-18); Hedin, 1974 (p.128, figs.7g,h).

Material examined: Yŏngil Bay, Nov., 1985

10. *Tintinnopsis kofoidi* Hada, 1932

Tintinnopsis kofoidi Hada, 1932a (p.210, figs.2,3); 1932b (p.44, fig.6); 1932c (p.560, fig.9); 1937 (p.165); Balech, 1948 (p.3, figs.10,12); Cosper, 1972 (p.397, fig.3); Gold and Morales, 1975a (p.523, fig.9).

Meterial examined:Yŏngil Bay, Nov., 1986

11. *Tintinnopsis lohmanni* Laackmann, 1906

Tintinnopsis lohmanni Laackmann, 1906 [cited from Hada, 1932c (p.556)]; Hada, 1932c (p.556, fig.3); 1937 (p.168, fig.20); Hedin, 1974 (p.127, figs.6e,f).

Tintinnopsis turbo:Kofoid and Campbell, 1929 (p.49, fig19); Marshall, 1969 (sheet 117, p.10, fig.51).

Tintinnopsis vasculum:Kofoid and Campbell, 1929 (p.50, fig.29); Marshall, 1969 (sheet 117, p.10, fig.50); Gold and Morales, 1975a (p.524, fig.19); 1976 (p.387, fig.14).

Material examined:Yŏngil Bay, Jan., 1986

12. *Tintinnopsis radix* (Imhoff, 1886)

Codonella radix Imhoff, 1886 [cited from Kofoid and Campbell, 1929 (p.45)].

Tintinnopsis radix:Kofoid and Campbell, 1929 (p.45, fig.93); Hada, 1932c, (p.560, fig.10); 1935 (p.244); 1937 (p.166, fig.18); 1938 (p.100, fig.14); Kofoid and Campbell, 1939 (p.41); Tregouboff, 1957 (p.241, pl.56, fig.12); Marshall, 1969 (sheet 117, p.9, fig.35); Cosper, 1972 (p.401, figs.6,7); Gold and Morales, 1976 (p.387, fig.11).

Material examined: Yŏngil Bay, Oct., 1986

13. *Tintinnopsis tocantinensis* Kofoid and Campbell, 1929

Tintinnopsis tocantinensis Kofoid and Campbell, 1929 (p.48, fig.46); Hada, 1932c (p.559, fig.8); 1935 (p.244); Balech, 1948 (p.6, figs, 13-16); Cosper, 1972 (p.402, fig.4).

Tintinnopsis aperta var. *tocantinensis*:Hada, 1938 (p.101, fig.15).

Material examined:Yŏngil Bay, Oct., 1985

14. *Tintinnopsis tubulosoides* Meunier, 1910

Tintinnopsis tubulosoides Meunier, 1910 (pp.139,140, pl.12, figs.10,11); Kofoid and Campbell, 1929 (p.49, fig.74); Hada, 1932b (p.43, fig.5); Marshall, 1969 (sheet 117, p.10, fig.12); Gold and Morales, 1975a (p.524, fig.16).

Material examined:Yŏngil Bay, Oct., 1986

Familly Codonellopsidae Kofoid and Campbell, 1929

Key to genera

1. Lorica with a short collar -- *Stenosemella*
   Lorica with a long collar -- *Codonellopsis*

Genus *Stenosemella* Jorgensen, 1924

Key to species

1. Collar with fenestrae -- 2
   Collar without fenestrae -- *S. nivalis*
2. Collar with semicircular fenestrae -- *S. pacifica*
   Collar with arched fenestrae -- *S. parvicollis*

15. *Stenosemella nivalis* (Meunier, 1910) (P1.I, Fig.1)

Tintinnopsis nivalis Meunier, 1910 [cited from Kofoid and Campbell, 1929 (p.69)].

Tintinnopsis nucula: Campbell, 1926 (pp.179-236, pls.12-15).

Stenosemella nivalis:Kofoid and Campbell, 1929 (p.69, fig.136); Hada, 1932c (p.561, fig.11); 1937 (p.178, fig.26); 1938 (p.105, fig.20); Kofoid ans Campbell, 1939 (p.64, pl.3, fig.3); Campbell, 1942 (p.22); Marshall, 1969 (sheet 119, p.3, figs.5a,b); Hedin, 1974 (p.129, figs.8a-e, 11a).

Material examined: Yŏngil Bay, Nov., 1985

Description: Lorica small ovate; collar low, without windows; bowl expanding upwards to form a shoulder, conical in the lower region; aboral end bluntly pointed; wall of the collar hyaline but bowl with coarse agglomerated materials; length, 38-42μm; bowl diameter, 35-40μm; oral diameter, 20μm.

Remarks: Sometimes, it is very difficult to observe the collar of this species. Because the collar is very low and buried by agglomerated particles on the shoulder.

16. ***Stenosemella pacifica*** Kofoid and Campbell, 1929

Stenosemella pacifica Kofoid and Campbell, 1929 (p.70, fig.133); Balech, 1968 (p.170, fig.9).

Material examined:Yŏngil Bay, Nov., 1985

17. ***Stenosemella parvicollis*** (Marshall, 1934)

Codonellopsis parvicollis Marshall, 1934 [cited from Hada, 1938 (p.106)].

Stenosemella parvicollis:Hada, 1935 (p.244); 1938 (p.106, fig.21).

Material examined: Yŏngil Bay, Nov., 1985

Genus Codonellopsis Jorgensen, 1924

Key to species

1. Collar with fenestrae ---------- 2
   Collar without fenestrae ---------- *C. nipponica*
2. Collar with a few fenestrae ---------- *C. morchella*
   Collar with numerous fenestrae in spiral rows ---------- *C. ostenfeldi*

18. ***Codonellopsis morchella*** (Cleve, 1900) (P1. I, Fig.2)

Codonella morchella Cleve, 1900 [cited from Kofoid and Campbell, 1929 (p.83)].

Codonellopsis morchella: Kofoid and Campbell, 1929 (p.83, fig.165); Hada, 1938 (p.107, fig.22); Tregouboff, 1957 (p.243, pl.57, fig.12); Yuki, 1984 (p.53).

Codonellopsis indica Kofoid and Campbell, 1929 (p.80, fig.158); Hada, 1935 (p.244).

Codonellopsis erythraensis: Kofoid and Campbell, 1929 (p.79, fig.151).

Codonellopsis orientalis Hada, 1932c (p.563, fig.15).

Material examined: Yŏngil Bay, Nov., 1985

Description: Lorica consisting of an annular collar and a spherical bowl; collar with a somewhat flaring rim, slightly bulging near its middle, composed of spiral turns widening gradually downwards with a few (2-4) elliptical or oval fenestrae; fenestrae variable in size and site on the collar; bowl generally ovate; aboral region convex conical; aboral end usually round or rarely bluntly pointed; wall of the collar hyaline but bowl thick, coarsely agglomerated; length, 78μm; oral diameter, 33μm; bowl diameter, 50μm.

Remarks: Hada (1938) listed *C. indica* and *C. erythraensis* of Kofoid and Campbell (1929) and *C. orientalis* of Hada (1932c) as a synonym of *C. morchella*.

19. ***Codonellopsis nipponica*** Hada, 1964

Codonellopsis nipponica Hada, 1964 (p.3, fig.3); Yamaji, 1984 (p.172, pl.55, fig.13).

Material examined: Yŏngil Bay, Nov., 1986

20. ***Codonellopsis ostenfeldi*** (Schmidt, 1901) (P1, I, Figs.3,4)

Codonella ostenfeldi Schmidt, 1901 [cited from Kofoid and Campbell, 1929 (p.84)].

Codonellopsis ostenfeldi: Kofoid and Campbell, 1929 (p.84, fig.160); Hada, 1935 (p.245); 1938 (p.111).

Material examined: Yongil Bay, Nov., 1985

Description: Lorica consisting of an annular collar and a spherical bowl; collar with a slightly flaring rim, with 2-4 narrow spiral turns in its anterior part and 5-6 annular rows of elliptical fenestrae lying transversely on the lower part; fenestrae reducing gradually downwards; bowl globose; aboral end usually round or rarely bluntly pointed; wall of the collar hyaline but bowl thick, coarsely agglomerated; length, 120μm; oral diameter, 35μm; bowl diameter, 63μm.

Remarks: This species differs from the other species of *Codonellopsis* in having spiral rows of numerous fenestrae on the collar.

Familly Metacylididae Kofoid and Campbell, 1929

Key to genera

1. Lorica with spiral shelf ---------- *Climacocylis*
   Lorica with spiral turns on the suboral region ---------- *Helicostomella*

Genus *Climacocylis* Jorgensen, 1924

Lorica flaccid and translucent, generally tubular; oral margin entire; spiral band extending throughout or in at least upper 1/3 of lorica; spiral shelf projecting horizontally from middle of band aboral end with or without an aboral skirt, usually widely open with irregular margin; wall composed of large secondary prisms or alveoles.

Differ from genera *Metacylis* and *Helicostomella* in presence of the spiral shelf.

Includes only one species, *Climacocylis scalaroides.*

21. Climacocylis scalaroides Kofoid and Campbell, 1929 (P1. I, Figs.5,6)

Climacocylis scalaroides Kofoid and Campbell, 1929 (p.93, fig.187); 1939 (p.101, pl.6, figs.1,10); Campbell, 1942 (p.42); Tregouboff, 1957 (p.244, pl.57, fig.19); Marshall, 1969 (sheet 120, p.5, fig.16).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica small, stout, with cylindrical anterior region and posterior region slightly constricted; oral margin entire, not everted or incurved; with 4-8 spiral band resticted to anterior half or less, some turns bearing low, bluntly rounded median outer ridge, becoming wiser aborally; spiral shelf well developed in the between the spiral turns, somewhat fading out aborally; aboral end asymmetrical and irregular, with a aboral skirt; wall exceedingly transparent and delicate in texture, composed of subregular polyhedral prisms; prisms uniform in size and shape, but progressively larger from oral to aboral end; wall irregular in thickness, thickest in the spiral shelfs; length, 138μm; oral diameter, 33μm.

Remarks: This species has been known to be widely distributed in warm waters of the oceans. Wall is exceedingly transparent and delicate, and so easily overlooked.

Genus *Helicostomella* Jorgensen, 1924

Key to species

1. Oral margin with short trigonal teeth ---------- *H. subulata*

Oral margin without dentation -- *H. longa*

22. *Helicostomella longa* (Brandt, 1906)

Tintinnus mediterraneus var. *longa* Brandt, 1906 [cited from Kofoid and Campbell, 1929 (p.106)].

Helicostomella longa: Kofoid and Campbell, 1929 (p.106, fig.206); Hada, 1938 (p.115, fig.32); Kofoid and Campbell, 1939 (p.106, pl.6, figs.8,17); Campbell, 1942 (p.43).

Material examined: Yŏngil Bay, Oct., 1985

23. *Helicostomella subulata* (Ehrenberg, 1833)

Tintinnus subulatus Ehrenberg, 1833 [cited from Kofoid and Campbell, 1929 (p.107)].

Helicostomella subulata: Kofoid and Campbell, 1929 (p.107, fig.209); Hada, 1932b (p.46, fig.10); 1937 (p.185, fig.31); Tregouboff, 1957 (p.245, p1.57, fig.23); Marshall, 1969 (sheet 120, p.6, fig.24); Cosper, 1972 (p.407, figs.17, 18); Hedin, 1974 (p.130, figs.9c, e, f); Gold and Morales, 1975a (p.525, fig.27); 1976 (p.388, fig.3 (1)); Balech, 1980 (p.6, figs.6,8).

Helicostomella fusiformis: Kofoid and Campbell, 1929 (p.105, fig.207); Hada, 1932b (p.46, fig.9); 1937 (p.183, fig.30); Marshall, 1969 (sheet 120, p.6, fig.23).

Helicostomella edentata: Kofold and Campbell, 1929 (p. 105 , fig. 208); Marshall, 1969 (sheet 120, p.6, fig. 22).

Helicostomella kiliensis: Kofoid and Campbell, 1929 (p.105, fig.210); Marshall, 1969 (sheet 120, p.6, fig.25)

Helicostomella lemairei Balech, 1942 (p.249, figs.7-9).

Material examined: Yŏngil Bay, Apr., 1986

Family Epiplocylididae Kofoid and Campbell, 1929

Lorica short, acorn-shaped, sometimes with suboral shelf; aboral end blunt, acuminate, or with horn; wall partially or wholly covered with reticulation.

Includes only one genus, *Epiplocyloides*.

Genus *Epiplocyloides* Hada, 1938

Lorica acorn-shaped, with double oral rims, inner one entire, erect, little higher than the flaring outer; shallow oral gutter formed between them; bowl conical or cylindrical in the upper main part, convex conical or broadly rounded in the aboral region having always a short horn; wall separated in the oral border, with a fine primary structure, surface covered with a coarsely anastomosed reticulation and linear striae.

This genus includes species which were formerly included in *Epiplocylis*, but which have a collar. Hada (1938) defined there as a new genus, *Epiplocyloides*.

Includes two species as follows, *E. ralumensis* and *E. reticulata.*

Key to species

1. Lorica with reticulations throughout -- *E. ralumensis*
   Lorica with reticulations on the aboral region --- *E. reticulata*

24. *Epiplocylodes ralumensis* (Brandt, 1906) (P1.I, Figs.7,8)

Ptychocylis reticulata var. *ralumensis* Brandt, 1906 [cited from Kofoid and Campbell, 1929 (p.184)].

Epiplocylis ralumensis: Kofoid and Campbell, 1929 (p.184, fig.320).

Epiplocyloides ralumensis: Hada, 1938 (p. 129).

Epiorella ralumensis: Kofoid and Campbell, 1939 (p.137, pl.8, figs.4, 10).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica acorn shape; inner and outer collars developed and separated by a shallow oral gutter formed between them; inner collar sloping inward and higher than the outer; outer collar flaring (60°); bowl subcylindrical in its anterior half and broadly rounded or convex conical (90°) in the aboral region; aboral horn formed an inverted cone of 35°; wall reticulated throughout, with no free line; reticulation rounded polygonal, showing irregular size; edge of the reticulation surrounded with reticular ridge; length, 78μm; oral diameter, 50μm.

Remarks: The species resembles *E. reticulata* in having an acorn shaped lorica but differ from in reticulations on the surface.

25. *Epiplocyloides reticulata* (Ostenfeld and Schmidt, 1901) (P1.I, Fig.9; Pl.II, Fig.1)

Cyttarocylis reticulata Ostenfeld and Schmidt, 1901 [cited from Kofoid and Campbell, 1929 (p.184)].

Epiplocylis reticulata: Kofoid and Campbell, 1929 (p.184, fig.325).

Epiplocylis brandti: Kofoid and Campbell, 1929 (p.177, fig.324).

Epiplocylis healdi: Kofoid and Campbell, 1929 (p.180, fig.321); Hada, 1935 (p.245).

Epiplocyloides reticulata: Hada, 1938 (p.130, fig.47); Marshall, 1969 (sheet 122, p.8, fig.33); Yuki, 1984 (p.55).

Epiorella healdi: Kofoid and Campbell, 1939 (p.136, pl.8, figs.12-14); Campbell, 1942 (p.74, fig.79); Silva, 1956 (p.362, pl.4, fig.10).

Epiorella brandti: Campbell, 1942 (p.73).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica acorn shaped; oral rim entire; inner and outer collars developed and separated by a shallow oral gutter; inner collar erect, little higher than the flaring outer; bowl subcylindrical in its anterior half and broadly rounded or convex conical (90°) in the aboral region; aboral region having a short, conical aboral horn; reticulation ususally ocvering the surface of the aboral region; subverticl, frequently anastomosing free lines stretched in the upper two-thirds of the bowl; length, 70μm; oral diameter, 48μm.

Remarks: This species differs from *E. ralumensis* in the presence of linear striae on the surface of the upper part of the lorica. This species is exceedingly variable in an elongation of the lorica, the shape of the aboral region and the area of reticulation of the surface. Therefore, Hada (1938) included *E. healdi* and *E. brandti* as a synonym of this species.

Family Ascampbelliellidae Corliss, 1960

Lorica cup-shaped, not elongate, with smooth to denticulate oral rim; one or two collars, wall thin and hyaline.

This family was split from the former Petalotrichidae by Corliss (1960).

Includes two genera, *Ascampbelliella* and *Acanthostomella*.

Key to genera

1. Collar without teeth -- *Ascampbelliella*
   Collar with teeth -- *Acanthostomella*

Genus *Ascampbelliella* Corliss, 1960

Lorica quite small, cup-shaped; with two collars, an inner and an outer separated by a trough between them; teeth absent on both rims; wall homogeneous.

Corliss (1960) proposed *Ascampbelliella* as replacement for *Craterella* Kofoid and Campbell, 1929 in accordance with provisions of the International Rules of Zoological Nomenclature.

26. *Ascampbelliella urceolata* (Ostenfeld, 1899) (P1.II, Figs.2,3,4)

Tintinnus urceolatus Ostenfeld, 1899 [cited from Kofoid and Campbell, 1929 (p.196)].

Craterella urceolata: Kofoid and Campbell, 1929 (p.196, fig.368); 1939 (p.142, pl.11, fig.17); Campbell, 1942 (p.49, fig.20); Tregouboff, 1957 (p.247, pl.58, fig.10).

Ascambelliella urceolata: Marshall, 1969 (sheet 122, p.3, fig.4).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica very small, cup-shaped, with a constricted aperture; oral margin thin, sharp-edged, and entire; outer and inner collar developed, separated by a shallow through; inner collar constricted to mouth, a basal segment of a truncated cone (80°) with concave side; outer collar flaring (50°); upper part of the inner collar surrounded with an annual band; bowl hemisrhepical or convex conical with a pointed but not prolonged or sharp end; wall hyaline and thin; length, 40μm; oral diameter, 30μm.

Remarks: This is a type species in genus *Ascambelliella*. The lorica is characterized by having a higher inner collar than outer.

Genus *Acanthostomella* Jorgensen, 1927

Lorica small, stout goblet-shaped; inner and outer collars developed to form a shallow trough between them, former elect and entire, latter flaring outwards and denticulated with a number of minute triangular teeth; aboral end rounded, pointed, or having a short spine; wall thin, hyaline.

Includes one species, *A. norvegica*.

27. *Acanthostomella norvegica* (Daday, 1887) (Pl. II, Figs.5,6,7)

Amphorella norvegica Daday, 1887 [cited from Kofoid and Campbell, 1929 (p.193)].

Acanthostomella norvegica: Kofoid and Campbell, 1929 (p.193, fig.363); Hada, 1932b (p.56, fig.22); 1932c (p.567, fig.20); 1937 (p.206, fig.49); Campbell, 1942 (p.51, figs.21,22,23); Marshall, 1962 (sheet 122, p.4, fig.8).

Material examined: Yŏngil Bay, Apr., 1986

Description: Lorica stout bell-shaped; inner and outer collars developed; inner collar a little higher than the outer; outer collar flaring (40-50°), denticulated with 20-36 incurved low triangular teeth; bowl slightly inflated in the post-median portion; aboral region rounded, but tapering into a short aboral horn with sharply pointed tip; wall uniformly thin and hyaline; length, 41μm; oral diameter, 24μm.

Remarks: This is a type species in genus *Acanthostomella*. This species has been known to be widely distributed in cold waters of the Atlantic and Pacific.

Family Ptychocylididae Kofoid and Campbell, 1929

Includes two genera, *Fevella* and *Ptychocylis.*

Key to species

1. Lorica without a bulge on the suboral region -- *Favella*
   Lorica with two bulges on the suboral region --- *Ptychocylis*

Genus *Fevella* Jorgensen, 1924

Key to species

1. Suboral region without a inflation -- *F. ehrenbergii*
   Suboral region with a inflation -- *F. taraikaensis*

28. *Fevella ehrenbergii* (Claparade and Lachmann, 1858)

Tintinnus Ehrenbergii Claparede and Lachmann, 1858 [cited from Kofoid and Campbell, 1929 (p.152)].

Favella ehrenbergii: Kofoid and Campbell, 1929 (p.152, fig.280); Hada, 1937 (p.186, fig.32); Tregouboff, 1957 (p.246, pl.58, fig.1); Marshall, 1969 (sheet 121, p.4, pl.6, fig.9).

Material examined: Yŏngil Bay, July, 1986

29. *Favella taraikaensis* Hada, 1932

Favella taraikaensis Hada, 1932b (p.47, fig.11); 1937 (p.187, fig.33).

Meterial examined: Yŏngil Bay, May, 1986

Genus *Ptychocylis* Brandt, 1896

Lorica with two bulge on the suboral region and sometimes one bulge on the posterior region: oral margin with samll trigonal teeth; bowl usually bell-shaped; aboral end constricting to a conical or blunt point; wall with very fine, subregular reticulation, thickened in the region of bulges.

Includes one species, *Ptychocylis obtusa*.

30. *Ptychocylis obtusa* Brandt, 1896 (Pl. II, Figs.8,9; Pl.III, Fig.1)

Ptychocylis obtusa Brandt, 1896 [cited from Kofoid and Campbell, 1929 (p.188)]; Kofoid and Campbell, 1929 (p.188, fig.349); Hada, 1932b (p.55, fig.21); 1932c (p.567); 1937 (p.200, fig.44); Campbell, 1942 (p.47, figs.57, 58); Marshall, 1969 (sheet 121, p.6, fig.24); Gold and Morales, 1975a (p.526, fig.31).

Material examined: Yŏngil Bay, Apr., 1986

Description: Lorica stout, squat shaped; oral margin denticulated with numerous triangular teeth; a band with linear striae between oral margin and first bulge; with two suboral expantions on the anterior region; aboral region abruptly conical, gradually terminating to a low aboral cone; aboral end broadly rounded; wall generally thickened at the suboral bulge and the aboral end; surface usually ornamented with a fine polygonal reticulation; length, 80μm; oral diameter, 55μm.

Remarks: This species is generally found in winter or early spring and may be as an indicator of cold currents. The variations of lorica shape in the genus *Ptychocylis* were examined by Davis (1981). He considered that there is one multivariate species, *P. acuta, P. arctica, P. basicurvata, P. cylindrica, P. drygalskii, P. glacialis* and *P. obtusa* and the lorica alone must be used to distinguish species in this genus.

Family Rhabdonellidae Kofoid and Campbell, 1929

Lorica conical to chalice-shaped; oral rim never with teeth; aboral horn in some species; wall with vertical ribs.

Dffers from all other families in having longitudinal ribs on the bowl.

Includes two genera, *Protorhabdonella* and *Rhabdonella.*

Key to genera

1. Lorica with a oral gutter ---------- *Rhabdonella*
   Lorica without a oral gutter ---------- *Protorhabdonella*

Genus *Protorhabdonella* Jorgensen, 1924

Lorica small, elongate or stout goblet-shaped; oral rim circular, always simple; bowl usually conical, tapering into an aboral born in some species; wall single-layered, hyaline, a number of ribs running longitudinally or somewhat spirally.

Includes three species as follows: *P. curta, P. simplex* and *P. striatura.*

Key to species

1. Lorica slender, elongate ---------- *P. striatura*
   Lorica stout, conical ---------- 2
2. Wall separated in the upper part of the lorica, with a few longitudinal ribs ---------- *P. simplex*
   Wall entirely single-layered, with numerous ribs ---------- *P. curta*

31. *Protorhabdonella curta* (Cleve, 1901) (Pl. III, Figs.2,3)

Cyttarocylis striata forma *β curta* Cleve, 1901 [cited from Kofoid and Campbell, 1929 (p. 207)].

Protorhabdonella curta: Kofoid and Campbell, 1929 (p.207, fig. 393); Hada, 1937 (p.207, fig.50); 1938 (p.139, fig.56); Kofoid and Campbell, 1939 (p.155, pl.12, figs.2,7); Campbell, 1942 (p.54); Tregouboff, 1957 (p.248, pl.58, fig.15); Marshall, 1969 (sheet 122, p.5, fig.13).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica tiny conical; oral margin simple, entire, slightly flaring; bowl slightly contracted below suboral region and somewhat dilated in the promedian part; contsricting aborally in a convex cone (60°); aboral end bluntly pointed; wall thin, hyaline, uniform in thickness throughout, except for increase in suboral region; surface ornamented with numerous ribs(18-24) running longitudinally through the entire lorica; ribs without bifurcations or anastomoses; no fenestrae seen; length, 45μm; oral diameter, 25μm.

Remark: This species differs from *P. simplex* chiefly in having more ribs.

32. *Protorhabdonella simplex* (Cleve, 1900) (Pl. III, Figs.4,5)

Cyttarocylis simplex Cleve, 1900 [cited from Kofoid and Campbell, 1929(p.208)].

Protorhabdonella simplex: Kofoid and Campbell, 1929(p.208, fig.395); Hada, 1935(p.246); 1938(p.138, fig.55); Kofoid and Campbell, 1939(p.156, pl.12, fig.3); Campbell, 1942(p. 54, figs.83, 84); Tregouboff, 1957(p.248, pl.58, fig.14); Marshall, 1969(sheet 122, p.5, fig.14); Gold and Morales, 1977(p.585); Balechi, 1980(p.7, fig.10); Yuki, 1984(p.54, pl.1, fig.6).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica stout, conical vase-shaped; oral margin entire; low collar surrounded with a annual band; with a evident rounded shoulder just below the collar; bowl more or less diluted to the anterior part, then convex conical and distally tapering to a acute aboral point with distal angle of 70°; wall thin, hyaline and uniform thickness except in thicker suboral region, provided with 7-9 longitudinal blade like ribs extending from suboral ring to the aboral end, no fenestrae seen; length, 58μm; oral diameter, 30μm.

Remarks: This is a type species in genus *Protorhabdonella*. This species has been known to be widely distributed in warm waters of the world. The species differs from *P. curta* in having the partially separated wall and few ribs. Sometimes, branched ribs are observed on the aboral region of lorica.

33. *Protorhabdonella striatura* Kofoid and Campbell, 1929 (P1. III, Fig.6)

Protorhabdonella striatura Kofoid and Campbell, 1929(p.208, fig.392); Hada, 1938(p.139, fig.57); Kofoid and Campbell, 1939(p.157, pl.12, fig.6); Campbell, 1942(p.55); Gold and Morales, 1977(p.585); Yuki, 1984(p.54, pl.1, fig.7).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica elongated, chalice-shaped; oral margin entire, not guttered; bowl gradually tappering in the anterior region, more abruptly in the aboral region; aboral region slender, conical to a pointed aboral end; wall composed of a single-layer except the oral region and ornamented with numerous ribs(28-44); ribs subvertical, inclined slightly to right aborally; numerous small pores scattered between ribs; length, 109μm; oral diameter, 20μm.

Remarks: Kofoid and Campbell(1939) commented on some correlation of size with temperature as indicated in the relatively stouter lorica from the cooler waters. This species differs from *P. cuta* and *P. simplex* in having a elongated lorica and numerous ribs.

Genus *Rhabdonella* Brandt, 1907

Lorica conical or elongate chalice-shaped; oral border with a gutter between the inner and outer rims; bowl gradually tapering in the anterior part, abruptly narrowing in the aboral region; wall with a number of ribs which often branch on the surface and with minute fenestrae between ribs in many cases.

This genus belongs to the warm water group of the Tintinnina.

Includes two species, *R. poculum* and *R. striata.*

Key to species

1. Lorica short, with a stout conical aboral horn ---------- *R. poculum*
   Lorica slender, with a long and narrow aboral horn ---------- *R. striata*

34. *Rhabdonella poculum* (Ostenfeld and Schmidt, 1901) (Pl. III, Figs.7,8,9)

Cyttarocylis poculum Ostenfeld and Schmidt, 1901 [cited from Kofoid and Campbell, 1929(p.218)].

Rhabdonella poculum: Kofoid and Campbell, 1929(p.218, fig.405); Hada, 1935(p.246); 1938(p.143, fig.60); Kofoid and Campbell, 1939(p. 174, pl.12, fig.11); Campbell, 1942(p.60, fig.92).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica with a cylindrical upper and conical lower bowl and wide conical horn; oral margin entire, inner oral margin erect, outer one flaring; shallow gutter developed between inner and outer oral margin; bowl subcylindrical in the main part but aboral region abruptly narrowing to a stout horn forming a cone of 40°; wall single-layered except a border of an oral gutter and ornamented with numerous, 42-54, vertical ribs; ribs often branched and sometimes anastomosed; numerous oval fenestrae scattered on intercostal region; length, 95μm; oral diameter, 43μm.

Remarks; This species may be distinguished at once from other species by general form. The lorica is commonly brown. This species differs from *P. striata* in having a stouter lorica.

35. ***Rhabdonella striata*** (Biedermann, 1893) (Pl.IV, Figs.1,2)

Tintinnus striatus Biedermann, 1893 [cited from Kofoid and Campbell, 1929(p.219)].

Rhabdonella striata: Kofoid and Campbell, 1929(p.219, fig.411); 1939(p.178, pl.13, fig.10); Campbell, 1942(p.61); Tregouboff, 1957(p.249); Marshall, 1969(sheet 122, p.6, fig.23).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica conical chalice-shaped; oral margin double-layered, inner oral margin erect and outer margin flaring; outer oral margin thickened with rounded edge forming a lip; lip slightly undulating; circumoral gutter wide, shallow, concave between inner and outer oral margin; the upper bowl widely flaring(60°), than tapering to lower conical bowl(40°); aboral region abruptly narrowing(5°) into aboral horn; wall thick, decreasing below suboral region in upper and lower bowl, thickening in aboral horn; numerous vertical ribs branched and anastomosed on the wall surface; numerous small fenestrae developed between the ribs; length, 170μm; oral diameter, 55μm.

Remarks: This species has been known to be a most common *Rhabdonella* in the ocean and to be widely distributed in warmer seas. Ths lorica is characterized by having a sharply differentiated lower bowl.

Family Xystonellidae Kofoid and Campbell, 1929

Lorica elongate, chalice-shaped; usually with long, narrow, slender aboral horn; wall reticulate, sometimes hyaline only, never with vertical ribs or spiral structure.

Includes one genus, *Parafavella.*

Genus *Parafavella* Kofoid and Campbell, 1929

Lorica variously goblet-and chalice-shaped, often elongated; oral margin often denticulate; aboral region usually concave conical with a short or elongate oboral horn; wall with a regular haxagonal reticulation.

Includes two species, *P. gigantea* and *P. denticulata.*

Key to species

1. Lorica comparatively small, with aboral region gradually tappering, with a stout aboral horn

-- *P. denticulata*

Lorica comparatively large, with aboral region abruptly narrowing, with an elongate horn -- *P. gigantea*

36. ***Parafavella denticulata*** (Ehrenberg, 1840) (Pl.IV, Figs.3,4)

Tintinnus denticulata Ehrenberg, 1840 [cited from Kofoid and Campbell, 1929(p.163)].

Parafavella denticulata: Kofoid and Campbell, 1929(p.163, fig.310); Hada, 1932b(p.50, fig.15); 1932c(p.564); 1937(p.190, figs.34,35); Campbell, 1942(p.76, fig.50); Marshall, 1969(sheet 123, p.3, fig.6); Hedin, 1974(p.130, figs.10d,e,11g).

Mareial examined: Yŏngil Bay, Mar., 1986

Description: Lorica tall chalice-shaped; oral rim denticulated with 30-42 short, equidistant, triangular teeth; bowl cylindrical; aboral region constricting gradually(50°); aboral horn usually straight and conical(15°), occasionally curved, its tip pointed; wall with a regular hexagonal reticulation; length, 225μm; oral diameter, 24μm.

Remarks: This species has been known to be widely distributed in cold waters. And the lorica shows a great diversity in form and dimension, especially in length of the aboral horn. *P. denticulata* resembles *P. gigantea*, but is shorter and stouter, with a less lengthly horn.

37. ***Parafavella gigantea*** (Brandt, 1896) (Pl. IV, Figs.5,6)

Cyttarocylis gigantea Brandt, 1896 [cited from Kofoid and Campbell, 1929(p.165)].

Parafavella gigantea: Kofoid and Campbell, 1929(p.165, fig.311); Hada, 1932b(p.51, fig.16); 1932c(p.565); 1937(p.192, fig.36); Campbell, 1942(p.77, figs.52,53); Marshall, 1969(sheet 123, p.4, fig.10); Hedin, 1974(p.130, figs.10b,c, 11f); Gold and Morales, 1975a(p.526, fig.32); 1975b(pp.142-145, figs.1-3).

Parafavella brandti: Hada, 1932b(p.52, fig.17).

Materal examined: Yŏngil Bay, Mar., 1986

Description: Lorica large, tall, generall y cylindrical; oral margin denticulated with about 45-55 equidistant, narrow triangular, outward-flaring teeth; bowl nearly cylindrical but somewhat expanding in the suboral part and constricted slightly at the middle; aboral region convex conical and tapering into a slender horn; aboral horn usually straight or more or less curved with a pointed tip; wall slightly thickened suborally, with distinct rectangular radial prisms and surface meshwork uniformed with small haxagons in well developed pattern except in the horn; length, 370μm; oral diameter, 60μm.

Remarks: Davis (1978) suggested that from the lorica alone to distinguish among *P. cylindrica. P. gigantea, P. denticulata, P. dilitata, P. obtusangula, P. parumdentata,* and *P. elegans*. He also emphasized that additional methods for the distinction of species must be undertaken beyond simple examination.

In our present study, there are many various forms not to be identified. Despite this confusion, this species is tentatively reported.

Family Undellidae Kofoid and Campbell, 1929

Lorica goblet-shaped, occasionally elongate and sometimes with suboral ledge; suboral region variously diversified; aboral end closed; wall trilayered.

Differs from all other families in having distinct and thickened inner and outer layers and intermediate zone.

Kofoid and Campbell (1929) had established the family Undellidae for six genera, *Amplectella*, *Amplectellopsis, Cricundella, Proplectella, Undella,* and *Undellopsis*. But Balech (1975) proposed that *Proplectella* is reduced to a synonyms of *Undella*, and *Amplectellopsis* and *Cricundella* to synonyms of *Amplectella*.

Includes one genus, *Undella*.

Genus *Undella* Daday, 1887

Lorica bowl-shaped, elongated; oral margin thin; sometimes, inner collar formed by localized suboral thickening of inner side only of wall; without suboral ledge; aboral end pointed, rounded or flattened; wall trilamellate, hyaline without ornamentation on the surface.

Includes two species, *U. claparedei* and *U. perpusilla*.

Key to species

1. Lorica oblong, with more or less pointed aboral end -- *U. claparedei*
   Lorica small globose, with a broadly rounded aboral end --- *U. perpusilla*

38. Undella claparedei (Entz, 1885) (Pl.IV, Fig.7)

Tintinnus Claparedii Entz, 1885 [cited from Kofoid and Campbell, 1929 (p.276)].

Proplectella claparedei: Kofoid and Campbell, 1929 (p.276, fig.525); Hada, 1938 (p.157, fig.73); Kofoid and Campbell, 1939 (p.247); Campbell, 1942 (p.103); Tregouboff, 1957 (p.250, pl.59, fig.9); Balech, 1968 (p. 1986, Ags. 27-32); Marshall, 1969 (sheet 125, p.4, fig. 6)

Proplectella fastigata: Kofoid and Campbell, 1929 (p.278, fig.528);1939 (p.248, pl.23, fig.8); Campbell, 1942 (p.104, figs.80,96); Tregouboff, 1957 (p.251); Marshall, 1969 (sheet 125, p.4, fig.8).

Proplectella globosa: Kofoid and Campbell, 1929 (p.278, fig.541);1939 (p.249); Campbell, 1942 (p.104, figs. 95,100); Marshall, 1969 (sheet 125, p.4, fig.9).

Proplectella ovata: Kofoid and Campbell, 1929 (p.280, fig.529); 1939 (p.250, pl.23, fig.9); Campbell, 1942 (p.105, fig.101); Tregouboff. 1957 (p.251, pl.59, fig.13); Marshall, 1969 (sheet 125, p.4, fig.11).

Proplectella praelonga Kofoid and Campbell, 1929 (p.282, fig.527); 1939 (p.253, pl.23, figs.2,12); Campbell, 1942 (p.107); Marshall, 1969 (sheet 125, p.5, fig.13).

Proplectella tenuis: Kofoid and Campbell, 1929 (p.283, fig.536); 1939 (p.254, pl.23, fig.4); Campbell, 1942 (p.108, fig.94); Marshall, 1969 (sheet, 125, p.5, fig.13).

Proplectella biangulata Kofoid and Campbell, 1929 (p.276, fig.532); 1939 (p.246, pl.23, fig.7); Campbell, 1942 (p.102, fig.98).

Undella claparedei: Balech, 1975 (p.383, figs.29-35).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica ovoid shaped; oral margin smooth and thin without flare; inner and outer part of suboral region unlikely diferentiated each other; outer part cylindrical but inner part funnel-like (40°)with constricted inward; bowl ellipsoidal, broadest a little below the middle of the lorica; aboral end hemispherical and slightly pointed; thinning gradually to minimum at aboral end; length, 58μm; oral diameter, 29μm.

Remarks: This species differs from *P. perpusilla* in being more slender in form and having a slightly pointed aboral end. Balech (1975) listed *P. fastigata, P. globosa, P. ovata, P. praelonga, P. tenuis,* and *P. biangulata* of Kofoid and Campbell (1929) as synonymous with *U. claparedei*.

39. *Undella perpusilla* (Kofoid and Campbell, 1929) (Pl.IV, Fig.8)

Proplectella perpusilla Kofoid and Campbell, 1929 (p.281, fig.524); Hada, 1938 (p.157, fig.74); Kofoid and Campbell, 1939 (p.252, pl.24, figs.1,2); Campbell, 1942 (p.106); Gold and Morales, 1977 (p.585).

Undella perpusilla: Balech, 1975 (p.389, figs.40-42).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica short, ovoid shaped with wide-open aperture; oral margin sharp and smooth, slightly, narrower internally (40°)to the inner constriction; bowl globose, broadest near the middle of the lorica; aboral end broadly rounded; wall hyaline with maximum thickness near aboral end; length, 49μm; oral diameter, 35μm.

Remarks: This species differs from *U. claparedei* in being smaller and having a broadly rounded aboral end.

Family Tintinnidae Claparede and Lachmann, 1858

Includes five species genera as follows: *Amphorides, Steenstrupiella, Dadayiella, Eutintinnus*, and *Salpingella*.

Key to genera

1. Aboral end closed ---------- 2
   Aboral end opened ---------- 3
2. Lorica with a faceted collar ---------- *Dadayiella*
   Lorica with a simple flared collar ---------- 4
3. Lorica simple tubular, without fins on the aboral end ---------- *Eutintinnus*
   Lorica nail-shaped, with fins on the aboral end ---------- *Salpingella*
4. Lorica stout nail-shaped, with fins on the aboral end ---------- *Steenstrupiella*
   Lorica vase-shaped, with fins on the aboral region ---------- 5
5. Aboral end flattened ---------- *Amphorides*
   Aboral end pointed ---------- *Amphorellopsis*

Genus *Amphorides* Strand, 1926

Key to species

1. Lorica short, with a rounded aboral end ---------- *A. minor*
   Lorica elongate, with a truncated aboral end ---------- 2
2. Lorica typical vase-shaped ---------- *A. amphora*
   Lorica wide vase-shaped ---------- *A. quadrilineata*

40. *Amphorides amphora* (Claparede and Lachmann, 1858)

Tintinnus amphora Claparede and Lachmann, 1858 [cited from Kofoid and Campbell, 1929 (p.309)].

Amphorella amphora: Kofoid and Campbell, 1929 (p.309, fig.586); 1939 (p.330, pl.28, fig.20); Campbell, 1942 (p.112).

Amphorella brandti: Kofoid and Campbell, 1929 (p.309, fig.588); Hada, 1935 (p.247); 1938 (p.165, fig.82); Gold and Morales, 1977 (p.585, fig.15); Yuki, 1984 (p.56).

Amphorides amphora: Marshall, 1969 (sheet 126, p.3, fig.7).

Amphorides brandti: Cosper, 1972 (p.411, fig.22).

Material examined: Yŏngil Bay, Oct., 1986

41. *Amphorides minor* (Jorgensen, 1924) (Pl.IV, Figs.9,10)

Amphorella quadrilineata var. *minor* Jorgensen, 1924 [cited from Kofoid and Campbell, 1929 (p.310)].

Amphorella minor: Kofoid and Campbell, 1929 (p.310, fig.590); 1939 (p.331); Campbell, 1942 (p.112, figs.112,115); Tregouboff, 1957 (p.254); Marshall, 1969 (sheet 126, p.4, fig.10); Yuki, 1984 (p.56, pl.3, fig.1).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica short, asymmetrical vase-shaped; oral margin thin and smooth; collar with a low, widely flaring (80°); suboral region roundly constricted inward, with a nuchal constriction; bowl creased bag-shaped with cylindrical anterior part and pyramidal posterior part; aboral end rounded, truncated; 3 low fins reaching up on the bowl as far as 2/3 total length, slightly leiotrophic turning; wall hyaline, thickening from oral margin to maximum thickness in nuchal region; length, 90μm; oral diameter, 35μm.

Remarks: *Amphorella minor* is much shorter than other species which have the same general form. And this species is chracterized by having a rounded aboral end without depression.

42. *Amphorides quadrilineata* (Claparade and Lachmann, 1858) (Pl, IV, Fig.11; Pl.V, Fig.1)

Tintinnus quadrilineatus Claparede and Lachmann, 1858 [cited from Kofoid and Campbell, 1929 (p.311)].

Amphorella quadrlineata: Kofoid and Campbell, 1929 (p.311, fig.587); Hada, 1935 (p.247);1937 (p.209, fig.52); Kofoid and Campbell, 1939 (p.331, pl.28, figs.17,18); Campbell, 1942 (p.113, figs.111,113); Tregouboff, 1957 (p.254, pl.60, fig.6); Yuki, 1984 (p.56, pl.3, fig.2).

Amphorides quadrilineata: Marshall, 1969 (sheet 126. p.4, fig.11).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica, wide vase-shaped; oral margin annular and smooth; collar widely flaring (90°); bowl set off from collar by marked concave nuchal constriction; upper part of the anterior region with a gently shoulder and lower part cylindrical, following posterior region; posterior region tapering distally and convex conical; aboral end more or less concave in its center; 3 long fins reaching up on the bowl as far as 2/3 total length; a elliptical depressed region developed on the anterior end of fins; bowl circular in cross section in the anterior part without fins but gradually triagular in the posterior on account of development of three conspicuous fins extened through the entire bowl; wall hyaline and thickness in the neck; length, 140μm; oral diameter, 53μm.

Remarks: This species has been known to be widely distributed in temperate and tropical waters of the world. And it was reported as *A. brandti* (Hada, 1932c). Campbell described the lorica with 4 long fins. However, in our observations this species shows three fins on the bowl.

It is distinguished from *A. minor* by its larger size and more tubular bowl. It is not likely to be confused with other species of *Amphorides*.

Genus *Steenstrupiella* Kofoid and Campbell, 1929

Lorica stout trumpet-shaped; oral margin always entire; collar funnel-like, bowl stout or elongated, cylindrical anteriorly, sometimes with a median inflation or contraction posterioly slightly tapering, or slightly inflated; aboral end rounded, pointed, or pyramidal, with 4-10 low fins.

Includes on species, *S. robusta*.

43. ***Steenstrupiella robusta*** Kofoid and Campbell 1929 (Pl.V, Figs.2,3)

Steenstrupiella rubusta Kofoid and Campbell, 1929 (p.313, fig.595); 1939 (p.323, pl.28, fig.14); Campbell, 1942 (p.114, fig.114); Marshall, 1969 (sheet 126, p.3, fig.5).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica elongated stout nail-shaped; oral margin thin and smooth; collar widely flaring (80°) and low; the longer, tubelike anterior part of the bowl extended with uniform diameter; aboral region swollen hexagonal and generally pyramidal, with 6 low, line-like fins; aboral end bluntly pointed; wall hyaline, thicker at the neck and rapidly thinning to the aboral expansion: length, 123μm; oral diameter, 35μm.

Remarks: This species differs from *S. steenstrupii* in the shape of the aboral end.

Genus *Amphorellopsis* Kofoid and Campbell, 1929

Includes one species, *Amphorellopsis acuta*.

44. ***Amphorellopsis acuta*** (Schmidt, 1901)

Amphorella acuta Schmidt, 1901 [cited from Kofoid and Campbell, 1929 (p.315)].

Amphorellopsis acuta: Kofoid and Campbell, 1929 (p.315, fig.598); Hada, 1935 (p.247); 1938 (p.168, fig.85); Kofoid and Campbell, 1939 (p.334); Marshall, 1969 (sheet 126, p.4, fig.12); Cosper, 1972 (p.412, fig.21).

Material examined: Yŏngil Bay, Nov., 1985

Genus *Dadayiella* Kofoid and Campbell, 1929

Lorica tall goblet-shaped lorica; oral margin crenulated; collar with vertical ribs, giving rise to intercostal facets; bowl campanulate, usually constricting posteriorly to an elongated conical or cylindrical pedicel with or without distal bulbous enlargement; wall thin, structureless except in thickened wall of pedicel.

Includes one species, *D. ganymedes*.

45. ***Dadayiella ganymedes*** (Entz, 1884) (Pl.V, Figs.4,5)

Tintinnus Ganymedes Entz, 1884 [cited from Kofoid and Campbell, 1929 (p.321)].

Dadayiella ganymedes: Kofoid and Campbell, 1929 (p.321, fig.610); Hada, 1935 (p.247); 1938 (p.169, fig.86); Kofoid and Campbell, 1939 (p.344, pl.29, figs.1,7,9,13); Campbell, 1942 (p.116, fig.128); Tregouboff, 1957 (p.254, pl.60, fig.8); Marshall, 1969 (sheet 126, p.5, fig.16); Yuki, 1984 (p.56).

Dadayiella acuta: Kofoid and Campbell, 1929 (p.320, fig.609); Tregouboff, 1957 (p.254).

Dadayiella bulbosa: Kofoid and Campbell, 1929 (p.320, fig.611); 1939 (p.342, pl.29, fig.2); Campbell, 1942 (p.116): Marshall, 1969 (sheet 126, p.4, fig.15).

Dadayiella jorgensenii: Kofoid and Campbell, 1929 (p.321, fig.613); Marshall, 1969 (sheot 126, p.5, fig.17).

Material examined: Yongil Bay, June, 1986

Description: Lorica elongated, chalice-shaped; oral margin thin and crenulated with 16 crenulations; crenulations formed by vertical ribs and facets on the collar; collar more or less flaring and alternation unequal ribs, thicker ribs and thinner ribs; projected as thin oral spine above the oral margin; 8 oral spines surrounded on the oral margin and a thinner rib developed between the spines, thus consisting of 16 ribs and intercostal facets on the collar; anterior region of the bowl cylindrical but posterior region convex conical (40°); aboral end abruptly narrowing to a pointed aboral horn forming a cone of 15°, sometimes provided with a diamond-shaped or irregular bulb at the tip of the aboral horn; wall thin and clear, thinner and hardly visible at the collar; length, 103μm; oral diameter, 30μm.

Remarks: This is a type species in genus *Dadayiella* and has been known to be widely distributed in warm waters of the world.

Hada (1938) observed specimens having variously formed pedicels from Japanese water. From these observations on the variations of this species, he remarked that *D. acuta, D. bulbosa,* and *D. jorgensenii* are variable forms of this species.

Genus *Eutintinnus* Kofoid and Campbell, 1939

Includes five species as follows: *E. elegans, E. lususundae, E. pectinis, E. rectus*, and *E. tubulosus*.

Key to species

1. Oral margin smooth ………………………… 2
   Oral margin denticulate ………………………… 3
2. Lorica without median bulge ………………………… 4
   Lorica with median bulge ………………………… *E. elegans*
3. Lorica slender, with a conspicuous aboral flare ………………………… *E. pectinis*
   Lorica stout, with a slightly aboral flare ………………………… *E. rectus*
4. Lorica with a oral flare ………………………… *E. lususundae*
   Lorica without a oral flare ………………………… *E. tubulosus*

47. *Eutintinnus elegans* (Jorgensen, 1924) (Pl.V. Fig.6)

Tintinnus lusus-undae var. *elegans* Jorgensen, 1924 [cited from Kofoid and Campbell, 1929 (p.333)].

Tintinnus elegans: Kofoid and Campbell, 1929 (p.333, fig.630); Hada, 1938 (p.180, fig.96).

Tintinnus latus: Kofoid and Campbell, 1929 (p.334, fig.636).

Tintinnus brandti: Kofoid and Campbell, 1929 (p.332, fig.628).

Tintinnus medius: Kofoid and Campbell, 1929 (p.336, fig.629).

Eutintinnus elegans: Campbell, 1942 (p.120); Tregouboff, 1957 (p.255, pl.60, fig.16); Yuki, 1984 (p.57, pl.3, fig.8).

Eutintinnus latus: Campbell, 1942 (p.120); Tregouboff, 1957 (p.255, pl.60, fig.12); Marshall, 1969 (sheet 127, p.3, fig.6).

Eutintinnus brandti: Kofoid and Campbell, 1939 (p.365, pl.32, fig.9): Campbell, 1942 (p.119, fig.122); Marshall, 1969 (sheet 127, p.4, fig.9).

Eutintinnus medius: Kofoid and Campbell, 1939 (p.369, pl.31, fig.8); Campbell, 1942 (p.122); Marshall, 1969 (sheet 127, p.4, fig.9).

Material examined: Yŏngil Bay, Oct., 1985

Decription: Lorica elongated, cylindrical; oral margin flaring (20°), with a brim; shaft generally conical, more or less inflated near the middle; aboral aperture with a slightly flare (10°); wall thin, hyaline and thicher in throat; length, 240μm; oral diameter, 46μm; aboral diameter, 30μm.

Remarks:. This species has been known to be widely distributed in warm water regions.

Hada (1938) remarked that he can not see distinct differences in size and form among *E. elegans*, *E. ratus*, *E. brandti*, and *E. medius*. Therefore, he suggested these forms are probable to be comprised in the same species.

47. *Eutintinnus lususundae* (Entz, 1885)

Tintinnus Lusus-undae Entz, Sr., 1885 [cited from Kofoid and Campbell, 1929 (p.335)].

Tintinnus lusus-undae: Kofoid and Campbell, 1929 (p.335, fig.656); Hada, 1935 (p.248); 1938 (p.173, fig.88).

Tintinnus tubulosus: Hada, 1935 (p.247).

Eutintinnus lusus-undae: Kofoid and Campbell, 1939 (p.368, pl.32, fig.3); Campbell, 1942 (p.121, fig.125); Tregouboff, 1957 (p.255, pl.60, fig.11); Marshall, 1969 (sheet 127, p.3, fig.7); Yuki, 1984 (p.57).]

Material examined: Yŏngil Bay, Oct., 1986

48. *Eutintinnus pectinis* (Kofoid and Campbell, 1929) (Pl.V, Fig.7)

Tintinnus pectinis Kofoid and Campbell, 1929 (p.337, fig.643); Gold and Morales, 1976 (p.389, fig.3r).

Material examined: Yŏngil Bay, May, 1986

Description: Lorica tubular; oral margin flaring (50°) with 20 triangular minute teeth; shaft tapering without a bulge; aboral end flaring (40°) to a wide aboral aperture; wall thin, hyaline; length, 150μm; oral diameter, 60μm.

Remarks: This species differs from *E. elegans* and *E. lususundae* in having oral teeth and also differs from *E. rectus* in having a narrow and slender lorica. This species seems to be a cold water form.

49. *Eutintinnus rectus* (Wailes, 1925) (Pl.V, Fig.8)

Tintinnus lusus-undae var. *rectus* Wailes, 1925 [cited from Kofoid and Campbell, 1929 (p.338)].

Tintinnus rectus: Kofoid and Campbell, 1929 (p.338, fig.645); Hada, 1932 (p.57, fig.23); 1937 (p.212, fig.54).

Material examined: Yŏngil Bay, May, 1986

Description: Lorica tubular, rather stout; oral margin slightly flaring, with 40-50 sharp triangular teeth; shaft scarcely dilated in the portion; aboral end smooth, opened with a slightly flarging, sometimes almost invisible; wall thin and hyaline; length, 180μm; oral diameter, 50μm; aboral diameter, 40μm.

Remarks: This species differs from *E. pectinis* in having the larger and stouter lorica.

50. *Eutintinnus tubulosus* (Ostenfeld, 1899)

Tintinnus tubulosus Ostenfeld, 1899 [cited from Kofoid and Campbell, 1929 (p.340)]; Kofoid and Campbell, 1929 (p.340, fig.651); Hada, 1937 (p.211, fig.53).

Eutintinnus tubulosus: Kofoid and Campbell, 1939 (p.374, pl.32, fig.8); Campbell, 1942 (p.125); Tregouboff, 1957 (p.255); Marshall, 1969 (sheet 127, p.4, fig.11); Cosper, 1972 (p.413, fig.26).

Material examined: Yŏngil Bay, Oct., 1985

Genus *Salpingella* Jorgensen, 1924

Includes two species as follows: *S. acuminata* and *S. subconica*.

Key to species

1. Lorica small, stout, with 4 vertical fins on the aboral region ------------------------------------ *S. subconica*
   Lorica elongate, trumpet-shaped, with 6 vertical fins on the aboral region ----------------- *S. acuminata*

51. *Salpingella acuminata* (Clapared and Lachmann, 1858) (Pl.V, Fig.9)

Tintinnus acuminatus Claparede and Lachmann, 1858 [cited from Kofoid and Campbell, 1929 (p.350)].

Salpingella acunimata: Kofoid and Campbell, 1929 (p.350, fig.682); Hada, 1937 (p.213, fig.56); 1938 (p.183, fig.100); Kofoid and Campbell, 1939 (p.381, pl.33, fig.7); Campbell, 1942 (p.126, fig.118); Tregouboff, 1957 (p.256); Marshall, 1969 (sheet 127, p.4, fig.16); Gold and Morales, 1977 (p.587); Yuki, 1984 (p.57)

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica elongate, nail-shaped; oral margin annular, thin; collar forming a low funnel of 90°; shaft cylindrical in the anterior two-thirds and slightly bulged in the posterior one-third, then gradually tapering to a truncated aboral end; 6 bladelike fins spiraled on the aboral cone, arising from just above th aboral end, slightly twisting to the left; wall hyaline and thickest in collar, thining in shaft; length, 230μm; oral diameter, 30μm.

Remarks: This is a type species in genus *Salpingella* and has been known to be widely distributed in cold and warm waters of the world. This species has a more flaring funnel and is longer than *S. subconica*.

52. *Salpingella subconica* Kofoid and Campbell, 1929 (Pl.V, Fig.10)

Salpingella subconica Kofoid and Campbell, 1929 (p.355, fig.676); 1939 (p.391, pl.35, fig.5); Campbell, 1942 (p.131).

Material examined: Yŏngil Bay, Oct., 1985

Description: Lorica nail-shaped; oral margin circular, thin, lacking locally thickened circumoral rim; collar a steep funned (40°); shaft cylindrical in the anterior region and tapering posteriorly (10°); low, bladelike 6-7 fins decurrent in the posterior region; aboral end bluntly opened with a tiny aperture; wall hyaline, thin, uniforming in thickness thoughtout; length, 148μm; oral diameter, 23μm.

Remarks: This species has much less of a suboral flare than *S. acuminata* and lacks the expanded aboral end.

ABSTRACT

Tintinnids, small ciliated protozoan, play an important roles as a lower lever producer in marine ecosystem. The present study, as a part of taxonomical studies on tintinnids in Korean coastal waters, has been carried out to clarify the primary faunal survey of the tintinnids in Yŏngil Bay, following the taxonomical study on tintinnids in Chinhae Bay.

The samples used for the present study were collected from a fixed station in Yŏngil Bay during the period from September, 1985 to May, 1988.

As a result 52 species in 21 genera distributed in 11 families were identified and 27 species among these identified species were described as new to Korean coastal waters.

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PHOTOGRAPHIC PLATES and EXPLANATION

Plate I

1. *Stenosemella nivalis*(Light microscopy, LM)
2. *Codonellopsis morchella* (Scanning electron microscopy, SEM), showing oval fenestrae on the collar
3. *C. ostenfeldi* (LM)
4. *C. ostenfeldi* (LM), showing narrow spiral turns and annular rows of elliptical fenestrae on the collar
5. *Climacocylis scalaroides* (LM with differential interference contrast), showing spiral shelfs in anterior region
6. *C. scalaroides* (LM with d.i.c.), showing spiral turns and subregular polyhedral prisms on the wall
7. *Epiplocyloides ralumensis* (LM with d.i.c.), showing acorn shaped lorica and double (inner and outer) collar
8. *E. ralumensis* (LM with d.i.c.), showing reticulated wall
9. *E. reticulata* (LM with d.i.c.)

Plate II

1. *Epiplocyloides reticulata* (LM with d.i.c.), showing wall with linear striae on the upper part and reticulation on the lower part
2. *Ascampbelliella urceolata* (LM), showing soft body in the lorica
3. *A. urceolata* (LM with d.i.c.), showing inner and outer collar in lateral view
4. *A. urceolata* (LM with d.i.c.), showing inner and outer collar in oral view
5. *Acanthostomella norvegica* (LM with d.i.c.), showing teeth on the outer collar
6. *A. norvegica* (LM with d.i.c.), showing inner and outer collar
7. *A. norvegica* (LM with d.i.c.), showing short aboral horn
8. *Ptychocylis obtusa* (LM with d.i.c.), showing numerous teeth on the oral margin and suboral bulge
9. *P. obtusa* (LM with d.i.c.), showing a band with linear striae between oral margin and first bulge

Plate III

1. *Ptychocylis obtusa* (LM with d.i.c.), showing a low aboral cone and wall with fine polygonal reticulation
2. *Protorhabdonella curta* (LM with d.i.c.)
3. *P. curta* (LM), showing numerous ribs
4. *P. simplex* (LM with d.i.c.)
5. *P. simplex* (LM with d.i.c.), showing longitudinal ribs
6. *P. striatura* (LM)
7. *Rhabdonella poculum* (LM), showing soft body in the lorica
8. *R. poculum* (LM with d.i.c.), showing inner and outer collar
9. *R. poculum* (LM with d.i.c.), showing wall with numerous vertical ribs

Plate IV

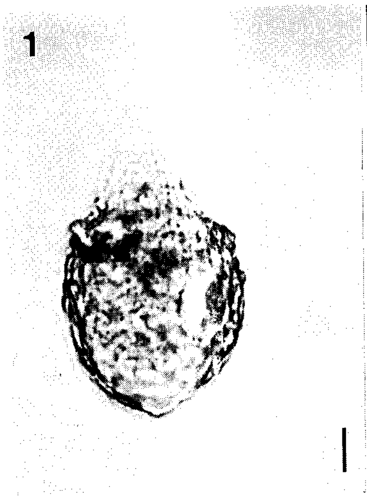
1. *Rhabdonella striata* (LM with d.i.c.)
2. *R. striata* (LM), showing wall with numerous vertical ribs and small pores
3. *Parafavella denticulata* (LM with d.i.c.), showing triangular teeth on the oral rim and wall with regular hexagonal reticulation
4. *P. denticulata* (LM with d.i.c.)
5. *P. gigantea* (LM with d.i.c.), showing triangular teeth and wall with small hexagons
6. *P. gigantea* (LM with d.i.c.), showing a long slender aboral horn
7. *Undella claparedei* (LM with d.i.c.)
8. *U. perpusilla* (LM with d.i.c.)
9. *Amphorides minor* (LM with d.i.c.)
10. *A. minor* (LM with d.i.c.), showing low fins on the bowl
11. *A. quadrilineata* (LM with d.i.c.)

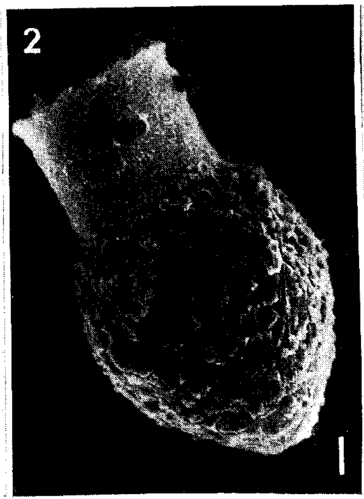
Plate V

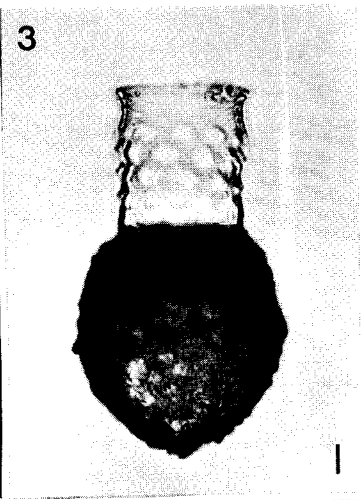
1. *Amphorides quadrilineata* (LM with d.i.c.), showing a elliptical depressed region on the anterior end of the fins
2. *Steenstrupiella robusta* (LM with d.i.c.)
3. *S. rodusta* (LM with d.i.c.), showing widely flaring collar
4. *Dadayiella ganymedes* (LM with d.i.c.), showing oral spine and crenulations on the collar
5. *D. ganymedes* (LM with d.i.c.), showing diamond-shaped aboral horn
6. *Eutintinnus elegans* (LM with d.i.c.)
7. E. pectinis (LM with d.i.c.), showing oral margin with triangular minute teeth
8. *E. rectus* (LM with d.i.c.), showing stout tubular lorica with teeth on the oral margin
9. *Salpingella acuminata* (LM with d.i.c.), showing lorica with bladelike fins on the aboral cone
10. *S. subconica* (LM with d.i.c.)

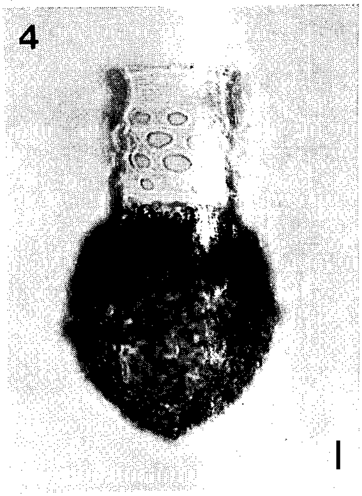
Scale bar = 10μm

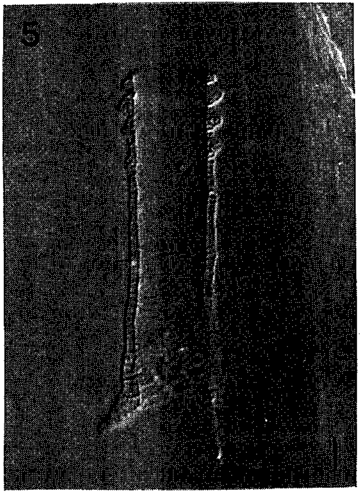
PLATE I

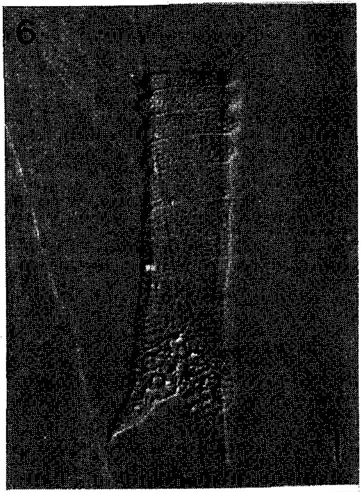


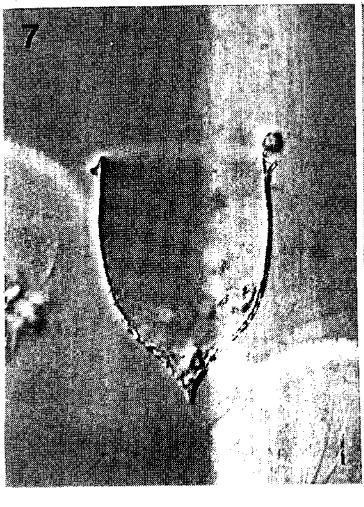


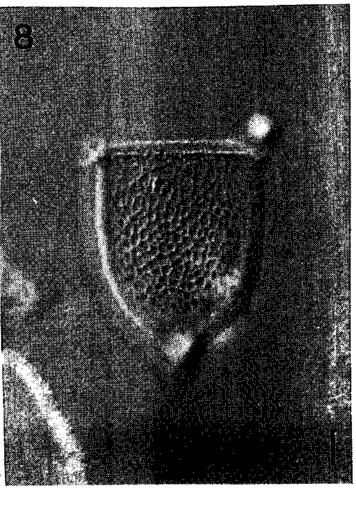


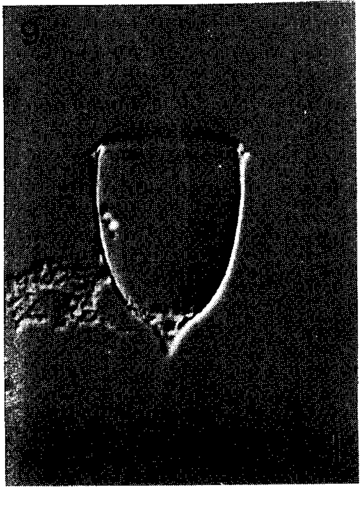












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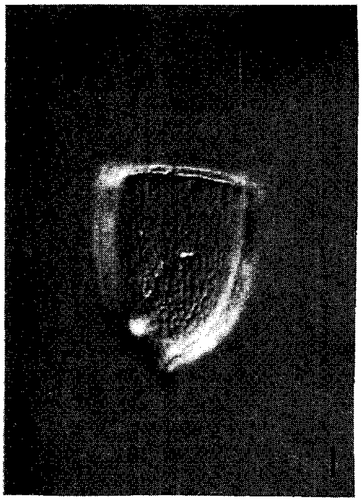

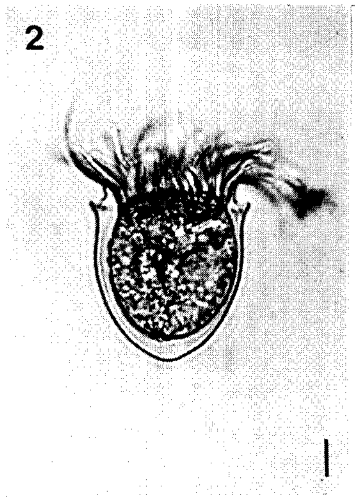
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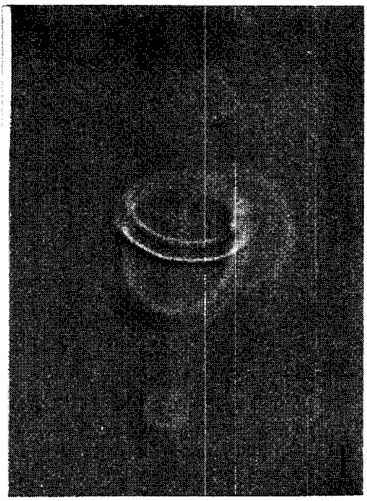

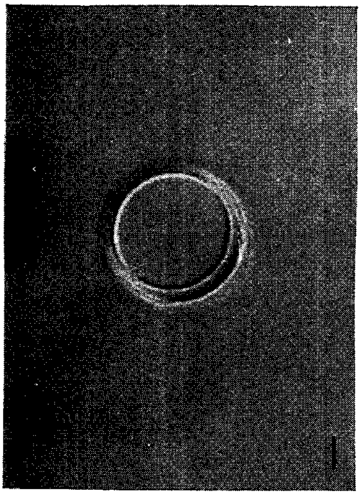

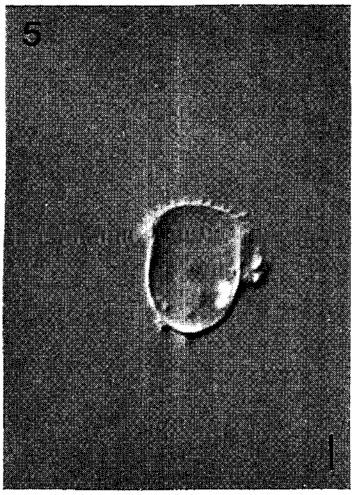
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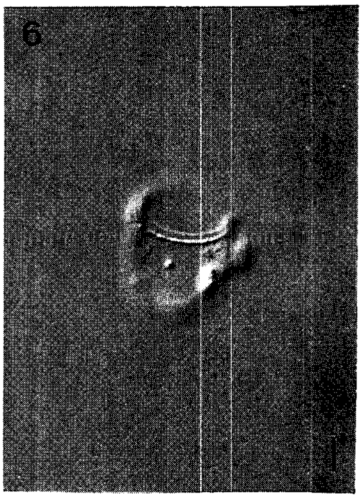
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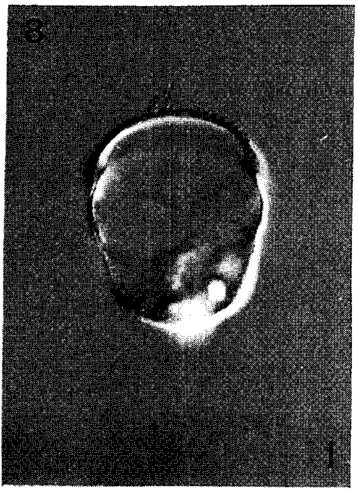
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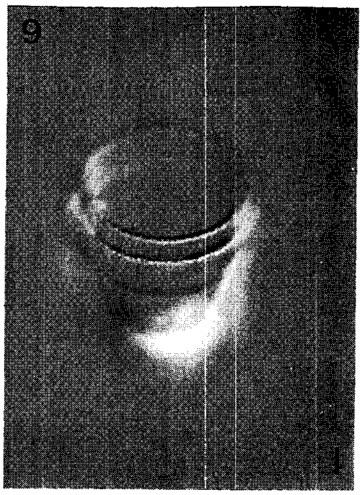
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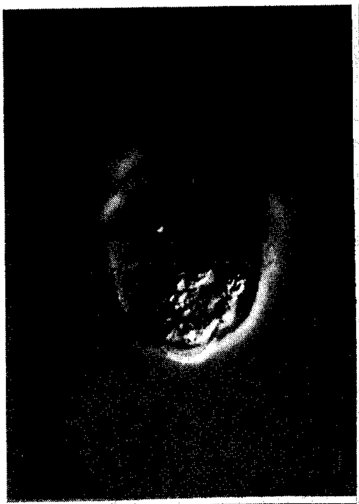
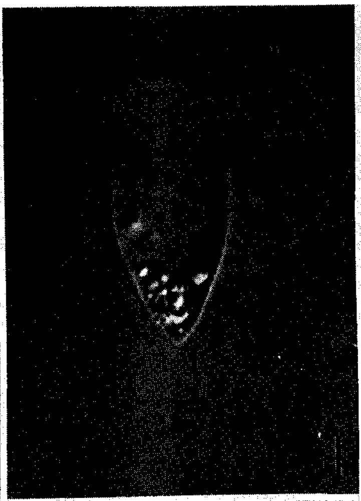
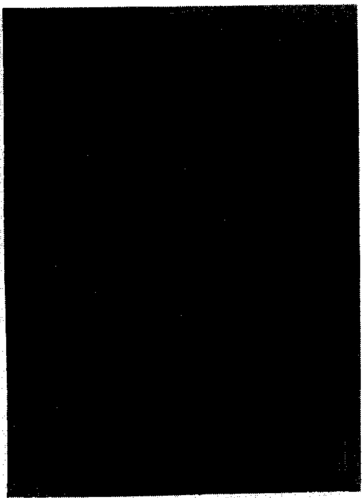
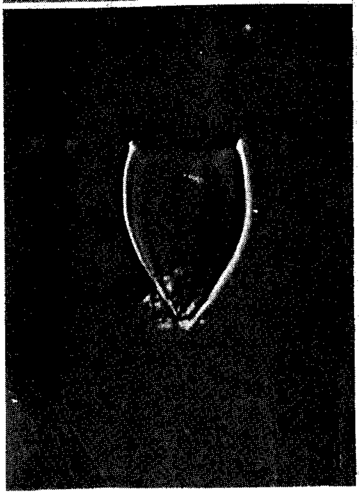

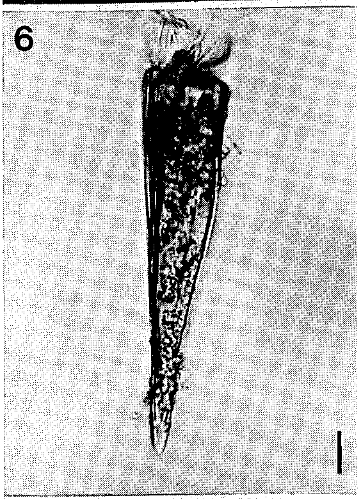
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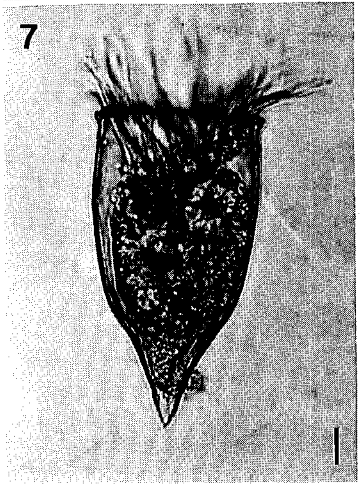
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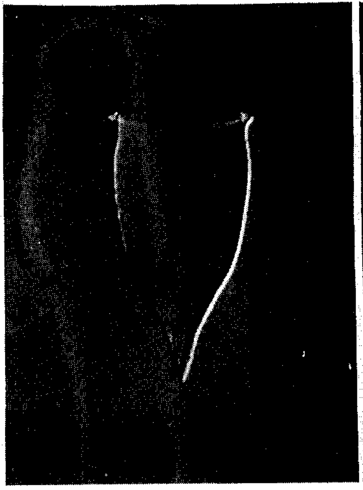
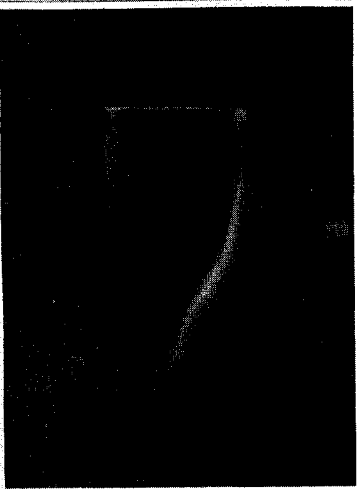
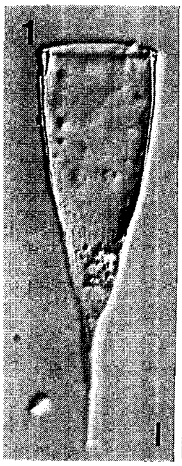
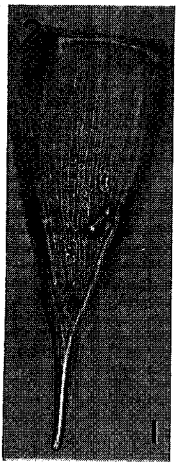
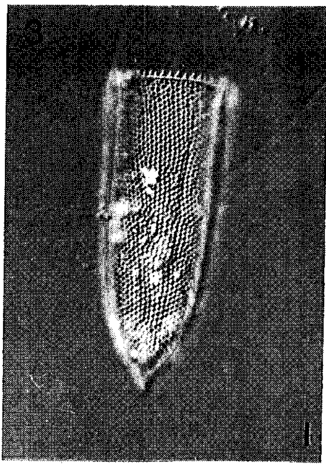
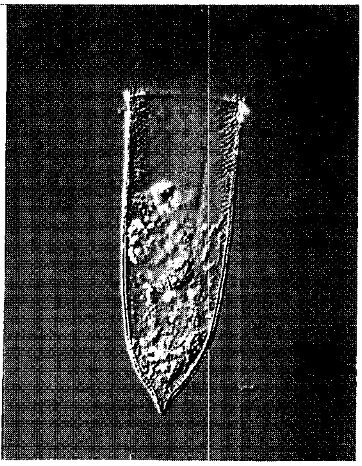



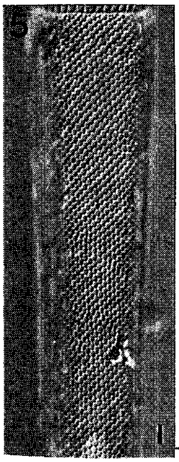
PLATE IV

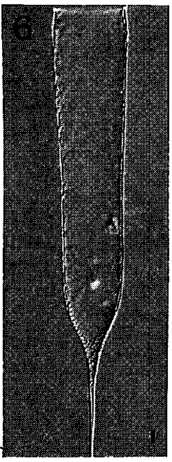


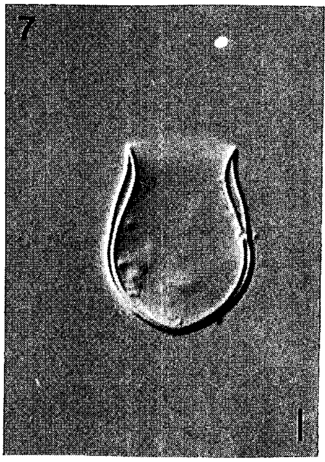


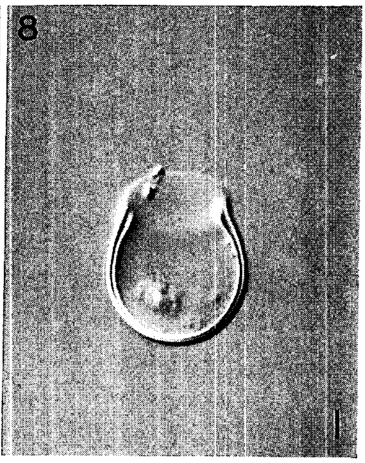


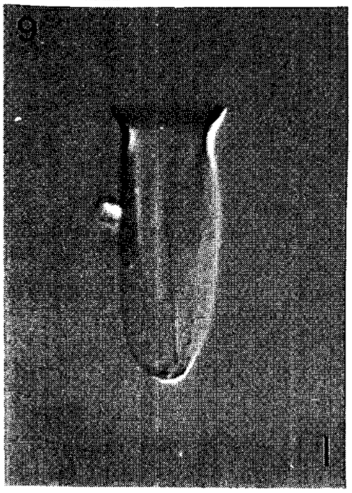


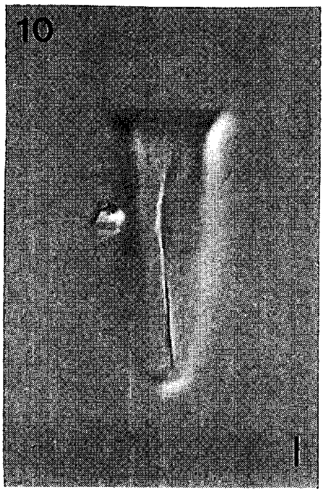












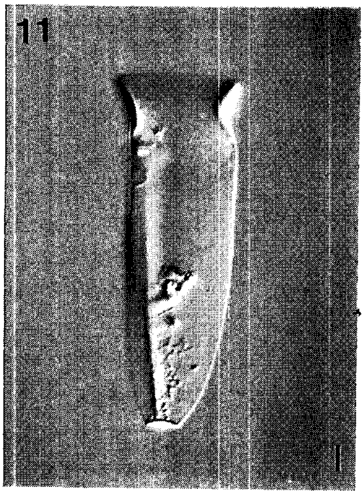


PLATE V